



## EPA Region 7 TMDL Review

**TMDL ID:** MO\_1381      **Waterbody ID:** MO\_1381  
**Waterbody Name:** LITTLE SAC RIVER  
**Tributary:** Slagle Creek, North Dry Sac River, Asher Creek, Little Dry Sac River, South Dry Sac River  
**Pollutant:** FECAL COLIFORM  
**State:** MO      **HUC:** 10290106  
**BASIN:** Osage River Basin  
**Submittal Date:** 7/13/2006  
**Approved:** Yes

### Submittal Letter

*State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.*

A letter dated July 11, 2006 and received by EPA July 13, 2006 formally submitted this TMDL for approval. Four comment letters were also submitted.

### Water Quality Standards Attainment

*The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.*

The TMDL for this watershed is a continuous curve calculated from discrete loading capacities over a range of flow conditions. Specific loading capacities (LC) are calculated by taking the flow rate times the 200 colonies/ 100 ml Water Quality Standards (WQS) times a conversion factor. This load is divided among the point sources (Wasteload Allocation-WLA) and non point sources (Load Allocation - LA) with an allowance for an explicit Margin of Safety (MOS). The given LC is likely to result in the attainment of water quality standards.

A library of DNA patterns has been developed that is specific to animals and humans living in the Little Sac River Watershed. Landscape samples were collected, analyzed and processed to build a database specific to this watershed. The contribution of each potential source is indicated by the relative presence of that particular pattern in the total array, and expressed as a percentage. DNA analysis of samples determines what proportions of fecal coliform come from each potential source.

### Numeric Target(s)

*Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.*

The standards that apply are found in the Missouri Water Quality Standards (WQS) at 10 CSR 20-7.031(4)(C).

Protection of whole-body-contact recreation is limited to classified waters designated for that use. For periods when the stream or lake is not affected by storm water runoff, the fecal coliform count shall not exceed 200 colonies/ 100 ml during the recreational season in waters designated for whole-body-contact recreation or at any time in losing streams. The recreational season is from April 1 to October 31.

The MDNR has recently conducted a WQS review. The revision was adopted in November 2005 and includes both the existing fecal coliform criterion of 200 colonies/ 100ml and the new *Escherichia coli* (E.coli) criterion of 126 colonies/100ml. The fecal coliform criterion is to be phased out by the end of 2008 and replaced with the new criterion. For the purposes of this TMDL, the existing fecal coliform standard will be used.

Designated uses:

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life and Human Health Associated with Fish Consumption
- Cool Water Fisheries
- Whole Body Contact Recreation (Swimming)
- Secondary Contact Recreation (Canoeing and Boating)

Impaired for Whole Body Contact Recreation

#### **Numeric Target(s) and Pollutant(s) of concern**

*An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.*

Due to the nature of point source versus nonpoint source contributions to fecal coliform loading, a continuous curve calculated from discrete loading capacities over a range of flow conditions were used to link fecal coliform loads to sources. Nonpoint contributions to the load are strongly correlated with high flow conditions and runoff from rainfall events. Point source contributions will dominate the loading when streamflow is low. The TMDL is based on the numeric water quality criteria for fecal coliform bacteria. The targeted criterion is directly linked to Missouri WQS.

#### **Source Analysis**

*Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.*

There are several sources in the watershed that could explain the high concentrations of fecal coliform found in the water. All of them are potential sources of bacteria and nutrients. Sources include livestock (mainly beef cattle), horses, failing septic tanks, wildlife (especially geese), storm runoff from urban areas, three permitted facilities (Northwest WWTP-MO0103039, Good Samaritan Boys Ranch-MO-0123277, and Pleasant View School-MO0124311). All sources have been considered.

#### **Allocation**

*Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.*

The TMDL recognizes allocations are dynamic and can vary with stream flow. The method used to account for the variation in flow is based upon water quality duration curves. The actual load is calculated based on daily flow value and the daily fecal coliform concentration. An average daily load was calculated over the recreation season. Flow values predicted by the SWAT model were used to calculate the LC at two different sites. To achieve and maintain WQS and protect the designated uses, a total source load reduction of 83% is required at site FR129 and 70% at site RD215. Total WLAs are set at  $9.47E+10$  colonies/day for all point sources. The total load capacity (LC) for the nonpoint sources is  $4.16E+11$  and  $1.20E+12$  colonies/day at each site, respectively.

## **WLA Comment**

This WLA is based on the fact that streams are particularly susceptible to the influence of point source discharges during low flow conditions.

WLA are set at a total of  $9.47E+10$  colonies/day. There are three point sources identified for this TMDL: Springfield NW WWTP, Good Samaritan Boys Ranch, and the Pleasant View School.

Only the load from the WWTP is significant compared to stream LC. Depending on the flow conditions, the actual load discharged by the WWTP represents 1%-5% of the actual stream load. The School and Boys ranch are permitted point sources, discharging within the Little Sac River watershed; bacterial modeling has determined that the contribution of the facilities to violating loads is insignificant.

## **LA Comment**

Results from a scenario analysis show cattle loading constitute 19% of the total loading, geese 18%, urban population 2%-6%, and unknown 76%-81%.

More than 83% of total flow is base flow. The LA at base flow is  $8.36E+10$  at FR129 and  $3.16E+11$  at RD215. The non point source LA is estimated as the LC - (MOS+WLA).

## **Margin of Safety**

*Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.*

An explicit MOS was calculated using a 95% confidence interval and a conservative estimate of the loadings. The 95% confidence was calculated using  $1.96 * (\text{std. deviation of the daily load capacity} / \text{square root of the number of values the average is based on } \{2140\})$ .

## **Seasonal Variation and Critical Conditions**

*Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).*

Little Sac is designated for whole body contact recreation during the period from April 1 to October 31. From spring to summer, human activities increase in and around the stream, cattle and geese contributions increase.

The bacterial sources do reflect these variations, with goose contributions varying according to their seasonal activities and population densities. However, the measured fecal coliform concentration did not indicate any variation from season to season and there is no reason to introduce a seasonal variation in the maximum daily load.

## **Public Participation**

*Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).*

Several steering committee meetings took place in Morrisville to explain the purpose of the TMDL and the process of developing it, and to provide input to FAPRI's study. In addition, three public meetings took place in Springfield on December 1, 2004, February 4 and May 3, 2005. The TMDL was public noticed on the MDNRs website from December 30, 2005 to March 30, 2006.

#### **Monitoring Plan for TMDL(s) Under Phased Approach**

*The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).*

Monitoring flows of the Little Sac River at RD215 is under the responsibility of USGS and will likely be on-going. The following water quality monitoring will likely also be on-going:

- Monitoring by MDNR at several sites on the river.
- Monitoring of swimming holes by the Greene County Department of Health. One of these sites is at Farm Road 125 close to the FR129 site.
- Monitoring by USGS at the Walnut Grove site, west of the landfill, on Route BB.
- Weekly monitoring by the Watershed Committee of the Ozarks at 23 sites from 2004 to 2007.

#### **Reasonable assurance**

*Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.*

Numerous past and current projects in the Little Sac River Watershed demonstrate the interest that the stakeholders have in the water quality of their stream. Other projects not directly related to the watershed are: Show-me-Yards which addresses residential lawns and gardens, aimed at reducing nutrient runoff, and Urban development techniques, aimed at reducing runoff of all pollutants in urban areas.

Given all the activity, it is likely that the water quality in the Little Sac Watershed will improve. Regarding the NW WWTP and other permitted facilities that discharge into the Little Sac River or tributaries, the department has the authority to write and enforce NPDES permits. Inclusion of effluent limits into a state NPDES permit, and daily monitoring of the effluent reported to the department, should provide reasonable assurance that in stream water quality standards will be met.